Extracorporeal CO_2 removal ($ECCO_2R$) via an umbilical A-V-shunt during apnoic O_2 diffusion +)

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A further advance in extracorporeal gas exchange systems was made when KOLOBOW evaluated extracorporeal CO_2 removal during O_2 diffusion in the not ventilated apnoic lung (4). This method which provides "rest" for the lung has been successfully applied by GATTINONI in adult patients with ARDS (shock lung disease) (3).

In order to make the extracorporeal gas exchange more practicable for the neonate directly after birth, we evaluated a modification of this method using an umbilical arterio-venous (A-V) shunt for CO_2 removal in apnoic premature lambs as an animal model.

The extracorporeal circuit included catheters for the umbilical artery and vein, a 0.4 m^2 Scimed KOLOBOW membrane lung® (ML), 3/16" Tygon tubing® and a flow probe sensor. It has a priming volume of only 116 ml (Fig.1).

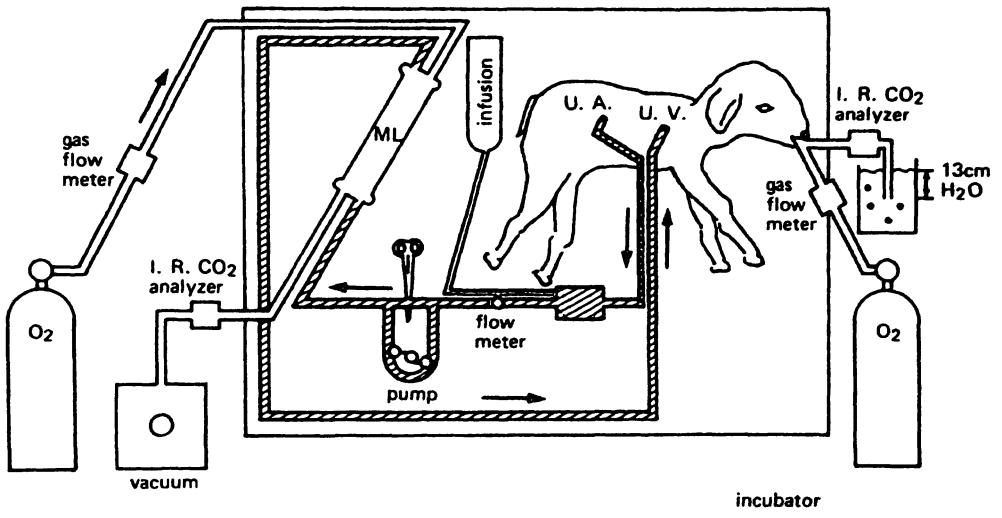

Fig. 1: Extracorporeal circuit (A-V) for CO_2-removal

Low flow perfusion can be achieved alternatively with or without the interposition of a mechanical pump (1). By means of continuous infusion a Prostacyclin-Analogon (Schering ZK 36374) was applied with a constant rate of 600 ng/kg/min in order to inhibit the aggregation of the thrombocytes in the perfusion circuit. An intratracheal tube was connected to a CPAP system regulated at a pressure of 13 cms of H_2O in order to provide a constant intrapulmonary pressure (IP). Oxygen was insufflated through a small catheter 1 mm - 2 mm, whose tip was located in the trachea, near its bifurcation. While the flow rate in the perfusion circuit was gra-

dually increased to 70 ml/kg/min, extracorporeal CO_2 removal was provided. We found that the Pco_2 values were rather stable between 55 and 65 mm Hg. During the perfusion we noted a drop of the pH values during the first 1/2 hour. Such a pH drop due to a rise of lactic acid did not occur again during the following hours of perfusion. The Po_2 level was dependent on the O_2 gas flow rate through the small insufflation catheter. There was only a minor drop in blood pressure at the beginning of the perfusion.

All premature lambs of this series were sacrificed at the end of perfusion to perform morphologic studies. The ultramicroscopical picture of the lung after the perfusion showed laminar bodies in the pneumocytes type 2 and surfactant material secreted into the alveolar space.

These results are preliminary but as they confirm a postnatal induction of lung maturation they could be of great clinical value for the management of still hopeless cases (2).

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